

# GUAM YEAR OF THE REEF 2018 NEWSLETTER

Photo: A. Miller

AUGUST 2018

## How does climate change impact Guam's coral reef ecosystems?

**Climate change is the number one driver of coral reef degradation around the world.**

Climate change is caused by the emission of greenhouse gases (GHGs), such as carbon dioxide and methane, which trap heat in the atmosphere and warm the planet. GHGs are emitted when fossil fuels are burned to power our cars, generate electricity, grow food, and manufacture goods. Electricity and heat production account for 25% of global GHG emissions. Food production is another main contributor to climate change, with agriculture, forestry, and other land use responsible for 24% of GHG emissions annually.

According to NOAA and NASA, the top five warmest years on record have all occurred since 2010. This has huge impacts on our oceans, which cover about 70% of the earth's surface. NASA research shows that over 90% of the warming that has occurred on our planet in the last half century has taken place in the oceans. The oceans act like a sponge, absorbing most of the extra heat from the atmosphere. As human activities continue to contribute GHGs to the atmosphere and warm the planet, the ocean will continue to store the majority of this heat in its shallow layers, where coral reefs thrive.

**GHG emissions cause ocean warming and coral bleaching, sea level rise, and ocean acidification.**

### Coral Bleaching

Corals, which evolved over 500 million years ago, are able to build massive reef structures due to a very important relationship with tiny plants (algae) that live inside coral tissues. These symbiotic algae provide nutrients to corals, giving the

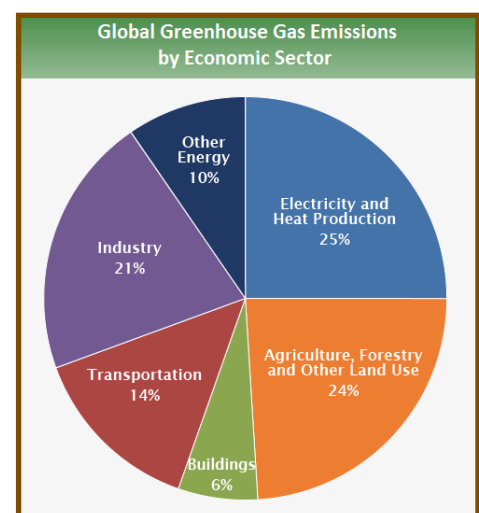


August's GYOR theme:

**“Climate change  
on Guam”**

This issue of the GYOR newsletter highlights how climate change affects Guam's oceans and coral reefs and describes simple steps you can take to help prevent climate change.

## #GYOR2018



Source: [U.S. Environmental Protection Agency](#)

corals enough energy to build the skeletons that make up reefs. The algae also give corals their bright colors; coral tissue is actually clear. In return, corals provide the algae with shelter.

The relationship between corals and their algae is sensitive to temperature. When ocean water becomes too warm, the algae become toxic to their coral hosts, and the corals will spit them out. Since corals get their color from the algae, this causes them to appear white as their skeleton is visible through their clear tissue—this is known as coral bleaching. Once they've lost their algae, corals are weak and begin to starve. They are also more vulnerable to disease and predation. If water temperature decreases and returns to normal, the corals can retrieve their algae and survive. However, if the water stays hot for a long time, many corals will die. As climate change continues to cause ocean warming, bleaching is predicted to occur more frequently.

The frequency and severity of coral bleaching events is increasing rapidly. Guam's reefs bleached in 2013, 2014, 2016, and 2017—four times in the past five years. This is far more frequent than other places around the world, making coral bleaching a major concern for



*Bleached (top) and unbleached (bottom) staghorn corals. These corals provide fish habitat and protect shorelines from wave energy. Unfortunately, they are highly susceptible to bleaching. (Photos: W. Hoot/D. Burdick)*



*In 2017, local reef managers detected severe coral bleaching at depths down to 130 ft. (Photo: W. Hoot)*

### Adaption vs. Mitigation

Adaptation and mitigation are terms often used when speaking about response to climate change. **Mitigation** refers to reducing the intensity of climate change, both by reducing GHG emissions and by increasing carbon sinks (like forests) that absorb these gases. **Adaptation** refers to adjusting systems and infrastructure to deal with the current and expected future impacts of climate change.

Both approaches are needed for human communities to deal with climate change.



local reef managers and scientists. Dr. Laurie Raymundo at the UOG Marine Lab monitors the health of Guam's shallow coral reef communities. [She found that](#) Guam lost about half of its staghorn corals from 2013-2015 due to the combined impacts of coral bleaching and extreme low tides.

Corals are more likely to recover from bleaching without impacts from other stressors. Factors such as water quality, sedimentation, overfishing, and physical impacts from recreational use may hinder recovery. By reducing local stressors, we can make Guam's reefs healthier and less vulnerable to the impacts of climate change. Reef managers and scientists are also applying coral reef restoration techniques to restore degraded reef habitats. Read the [June edition](#) of the GYOR newsletter or visit our website ([www.guamcoralreefs.com](http://www.guamcoralreefs.com)) to learn more.

## Sea Level Rise

Sea level rise is caused by two processes resulting from climate change: glacial melting and thermal expansion. As the planet warms, glacial ice is melting and adding water to our oceans. Ocean water is also expanding as it heats up. [According to the National Research Council](#), average global sea level increased by about eight inches between 1880 and 2009.

Because corals depend on their photosynthetic algae for nutrition, they can only survive in shallow, well-lit waters. If sea level rises rapidly, corals may not be able to grow quickly enough to remain within the shallow waters where they get enough light. In order to adapt, corals will have to shift into a new habitat. However, this may not be possible if their growth is limited by coastal infrastructure or other habitats, such as mangroves or seagrasses.

Coral reefs are critical for providing coastal protection and reducing wave energy. Therefore, coral reefs will become even more valuable as sea levels rise and threaten coastal human communities due to flooding and inundation.

## Ocean Acidification

Ocean acidification is the shift in ocean chemistry caused by climate change. Increased carbon dioxide in the atmosphere is absorbed by the oceans, lowering the pH of the water and making the oceans more acidic. This reduces corals' ability to produce the calcium carbonate they use to build their skeletons that create the framework of reefs. [According to the Smithsonian Institute](#), oceans are 30% more acidic than they were two centuries ago. This change is more rapid than any other known shift in ocean chemistry during the past 50 million years.

### Resources:

- NOAA Coral Reef Watch is a scientific tool used to predict the likelihood of coral bleaching in the near future. Check it out at [www.coralreefwatch.noaa.gov](http://www.coralreefwatch.noaa.gov).
- The Nature Conservancy's Reef Resilience Network shares information about how climate change impacts reefs: [www.reefresilience.org/coral-reefs/stressors/climate-and-ocean-change](http://www.reefresilience.org/coral-reefs/stressors/climate-and-ocean-change).
- The Eyes of the Reef Marianas Program teaches community members how to recognize coral bleaching and report it. Check out the website at [www.eormarianas.org](http://www.eormarianas.org).

## IN THE NEWS

- GVB and DAWR asked for volunteers to help clean up significant amounts of Chaetomorpha algae that washed into Tumon Bay during Tropical Storm Maria. This algae can smother coral reefs.
- UOG-CIS held a STEM expo on July 6. UOG Marine Lab student Karim Primov was featured for his work on coral population genetics in Dr. David Combosch's lab.
- Impacts to corals and fish from storm water runoff and sedimentation caused by Tropical Storm Maria were explored in an article by the Guam Daily Post.
- The UOG-CIS Upward Bound Program trained over 60 high school students on the value of food security and sustainable agriculture practices.
- Dr. Scott Heron and Dr. William Sweet of NOAA visited the UOG Marine Lab in July to share information on how extreme tides and sea level rise may affect reef restoration on Guam.

**September's theme:**  
**Reduce, reuse, recycle**

**#GYOR2018**

## Be part of the solution!

While climate change is a global issue, there are many actions you can take to reduce your carbon footprint and even save money. Join us in being part of the solution and [let us know on Facebook](#) what you've pledged to do in August to address climate change and help protect Guam's reefs:

**Transportation:** Carpool, take public transportation, or ride your bike

**Diet:** Eat less meat and more local produce

**At home:** Turn off lights, invest in solar panels, and upgrade to energy-efficient appliances

**Water:** Use less freshwater to reduce energy demands needed to pump, treat, and heat water

**In your garden:** Plant native vegetation and trees to store carbon and prevent erosion



## UPCOMING EVENTS

- August 18: Plant propagation workshop, 9:00 AM to 12:00 PM, Priest's Pools trailhead
- August 19: Science Sunday, 2:00 PM at the T. Stell Newman Visitor Center
- [Follow us on Facebook](#) to be notified of new events!